

REMARKS

The Office Action dated December 15, 2004 has been carefully considered. Claims 1, 4 and 7 are currently amended and claim 2 is cancelled. Claims 1, 3-7 are currently pending. Although the Office Action indicates Claims 1-6 are pending, Claim 7 was added by way of preliminary amendment, and in addition, is amended by the current amendment.

35 USC §112, ¶2 Rejections

The Office Action notes that the rejection under 35 USC § 112 second paragraph amendment to claim 6 is withdrawn in view of the amendment, and indicates that a similar amendment should be applied to claim 7. In accordance with that indication, claim 7 is amended to recite the positive step of polymerizing the acrylic acid.

35 USC §103 Rejections

Claims 1-6 stand rejected as obvious under 35 USC §103(a) as being unpatentable over U.S. Patent No. 4,873,368 to Kadowski, et al. ("Kadowski"). This rejection is traversed.

Because acrylic acid is an easily polymerizing compound, when propylene gas is provided in high concentration to the reactor, it is liable to generate an acrylic acid polymer at both the step for absorbing acrylic acid and the subsequent step for purification of the absorbed acrylic acid. As a result, when the concentration of acrylic acid is depressed by a variation in the composition of the bottom liquid of an absorption column, the maintenance of distillation conditions in a high acrylic acid concentration results in generation of an acrylic acid polymer in a distilling column. Additionally, the purification step of acrylic acid is often accomplished by adopting a series of different distilling columns, called a dehydrating column, a light ends cut column, and a heavy ends cut column. As a result of this arrangement the control of the purification is difficult as a result of the fact that a variation in the composition of the bottom liquid of any one of such distilling columns necessitates a change in the purification conditions of the subsequent steps. See, page 5, line 6 to page 6, line 6 in the specification.

By the invention as currently claimed, acrylic acid can be produced with improved productivity from propylene of high concentration in the reactor, and moreover, the operation of

the purification process can be simplified by providing high concentration of propylene to a reactor. Particularly by limiting the water content in the bottom liquid of the absorption column in the range of 1 - 45 wt. %, the occurrence of a polymer at the subsequent steps of the process can be effectively prevented. The control of the water content can be attained by adjusting the amount of an absorbent. Further, by focusing the acrylic acid concentration of bottom liquid in the absorption column at a narrow range within 1 - 45 wt. %, it is now possible to restrain the fluctuations of loss of acrylic acid in the absorption column and secure the stability of operation at the subsequent steps including the equipment for the treatment of the waste water by preventing polymerization. See Specification page 6, line 20 to page 7, line 10.

Claims 1 and 4 as currently amended now recite the limitation, "wherein said absorbent is introduced into said acrylic acid absorption column at a mass flow rate in the range of 0.1 - 1.5 times the mass flow rate of propylene introduced into said first reactor." By this feature the treatments at the subsequent downstream series of steps can be simplified and the variations restrained. See specification page 30, line 11 to page 31, line 25.

In contrast, Kadowski relates to a process for producing acrylic acid by a two-stage gas-phase catalytic oxidation including specific conditions (such as step A to D in claim 1) but does not teach or suggest such acrylic acid solution with a water concentration as recited in the invention as presently claimed. The Office Action indicates that Kadowski neither discloses nor suggests the absorption step b), resulting in a acrylic acid containing solution with a water concentration in the range of 1 - 45 wt. %, but asserts that one of ordinary skill in the art would expect that concentration of acrylic acid in the resulting solution of Kadowaki would be in this broad range of 1 to 45 % (water), and the record does not contain any objective evidence to the contrary.

However, such an expectation is not supported by Kadowski. Kadowski only discloses a process for producing acrylic acid by a two-stage gas-phase catalytic oxidation reactor; it does not describe or suggest a step with introducing the acrylic acid-containing gas into an acrylic acid absorption column and causing it to contact an absorbent after the oxidation reaction of propylene. Furthermore, Kadowski also does not teach or suggest any polymerization of the acrylic acid in the acrylic acid production process and purification process.

The advantages of the invention as currently claimed are illustrated by a comparison of the Examples in the specification. Example 1, performed at a mass flow ratio of the amount of absorbent/propylene within the scope of claim 1 as currently amended, and Example 6, performed at a mass flow ratio of the amount of the absorbent/propylene fixed outside of the claimed mass flow rate range, produced the following results:

	Example 1	Example 6
Mass flow ratio of the amount of absorbent/propylene	0.9	1.6
Efficiency of absorption	98.3%	97.1%
Polymer	Not detect	Detected in column

In view of the foregoing, Applicants submit that all pending claims are in condition for allowance and request that all claims be allowed. The Examiner is invited to contact the undersigned should he believe that this would expedite prosecution of this application. It is believed that no fee is required. The Commissioner is authorized to charge any deficiency or credit any overpayment to Deposit Account No. 13-2165.

Respectfully submitted,

Dated: March 15, 2005



Christopher S. Casieri
Reg. No. 50,919
Attorney for Applicant

MATHEWS, COLLINS, SHEPHERD & McKAY, P.A.
100 Thanet Circle, Suite 306
Princeton, NJ 08540
Tel: 609 924 8555
Fax: 609 924 3036